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Concern has been growing about possibly serious timber shortages in the Douglas-fir region of the Pacific Northwest (western Washington, western Oregon, and parts of northern California). A critical analysis is provided of 11 studies dealing with various aspects of the projected timber shortage in the Pacific Northwest. Findings/Conclusions: Generally, differences and conflicts in the conclusions reached by the 11 studies were due more to differing assumptions than to faults in the data used or to the ways the data were applied. The studies generally agreed that continuing current timber growing and harvesting practices would likely lead to a sizable drop of available timber from the Pacific Northwest in the years just ahead. The economic effects appeared to be considerably higher timber prices, a loss of market share by the region (in part to imports), and possibly a decline in regional employment and income. The studies also agreed that regional timber shortages could be averted by increased investment in growing timber, revised harvest schedules, or both. Questions raised by the studies concern: the optimum amount and application of forest investment; what, if any, changes should be made to harvest schedules; and the extent of possible environmental damage or limitations on nontimber uses of the forest that could result from these changes. Recommendations: The Secretary of Agriculture should prepare a single comprehensive study of harvest policy options for the Congress. (RRS)

BY THE COMPTROLLER GENERAL

Report To The Congress

OF THE UNITED STATES

8600

Projected Timber Scarcities In The Pacific Northwest: A Critique Of 11 Studies

A projected decline in timber supplies from the Pacific Northwest could result in

- an increase in the cost of wood,
- a decrease in the use of wood, and
- a serious impact on the local economy.

This is the subject of 11 studies that the House Committee on Interior and Insular Affairs asked GAO to review. Several of these studies showed that the timber scarcity could be overcome by combining increased investment and revised harvest schedules on public lands. Added Federal expenditures, however, and changes to forest legislation may be needed.

The Secretary of Agriculture should report to the Congress on unresolved issues such as the amount of increased forest cultivation and the volume of timber to be cut. Based on that report, the Congress should consider changes in forest legislation.



EMD-79-5
DECEMBER 12, 1978



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-125053

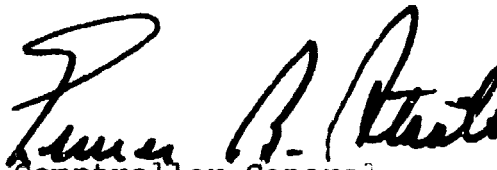
To the President of the Senate and the
Speaker of the House of Representatives

This report provides a critical analysis of 11 studies dealing with various aspects of a projected timber shortage in the Pacific Northwest Douglas-fir region. Most of the studies indicated that the shortage (expected in the years just ahead) could be alleviated or even averted by increased forest investment or revised harvest schedules on Federal lands.

These actions imply, however, increased Federal expenditures and probably changes to current statutes. Since the studies leave unanswered important questions on how such changes would affect cost tradeoffs, the environment, and multiple uses of the Nation's forests, we have recommended that the Secretary of Agriculture address these questions in a separate report to the Congress.

We made our review at the request of the former chairman of the House Committee on Interior and Insular Affairs.

We are sending copies of this report to the Director, Office of Management and Budget and to the Secretary of Agriculture.


Comptroller General
of the United States

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

PROJECTED TIMBER
SCARCITIES IN THE
PACIFIC NORTHWEST:
A CRITIQUE OF 11 STUDIES

D I G E S T

The possibility of a serious timber shortage in the Pacific Northwest is a growing national concern because the region is a major supplier of lumber and other wood products and a local concern because the area depends heavily on the industry for employment and income.

ISSUES RAISED IN THE STUDIES

Many studies concerned with forest management showed (see pp. 3-4) that a continuation of current Federal and private timber production practices would result in Pacific Northwest timber supplies being unable to keep up with increased demand. Lumber prices historically have risen faster than the general price level and probably would continue to rise rapidly--possibly a sixfold increase over the next several decades--while the use of wood products would decline.

The official U.S. Forest Service projection, is for an 18-percent drop in Pacific Northwest timber supplies over the next several decades, with the decline being filled by other regions and by imports.

Nearly all the studies dealt with increasing supplies of timber from Federal lands as the solution. Several concurred that an adequate increase could come from Federal lands without seriously depleting them, but differed over whether this should be done and, if done, on what sites. Some studies were confined to existing policies and laws; others implied definite changes to current statutes.

As a group, the studies raised most of the important issues currently affecting national timber policy and Federal forest management--

EMD-79-5

the amount of cutting that should take place, the degree of forest investment, the complex trade-offs between logging and other forest uses, and environmental issues in general.

STUDY FINDINGS

The cause of the projected decline in Pacific Northwest timber production has to do with the exhaustion of old-growth forests that typically contain trees well over 100 years old. They are of a size to yield the maximum wood per acre. Regenerated forests, by contrast, seldom contain trees more than 100 years old and, being smaller, yield less wood per acre. The conversion on industry lands from old growth to regenerated forests is well under way. In 1970, industry lands produced more than half the region's total timber harvest.

Some studies concentrated on the possibility of increased harvests on Federal land as a way of offsetting the projected decline from private lands. They found:

- On increased forest management--more intensive forest cultivation on Federal lands would eventually increase the yield, but under current harvest schedules most of the increase would occur well after the period of immediate shortage, 1985-2020. (See p. 14.)
- On alternate harvest policies--several variations to current harvest schedules projected substantially higher yields from the revised schedules in the first decade due to a high investment level of forest cultivation. The yields under the low investment projection dropped in subsequent decades; however, they never fell significantly below current levels.

Departures from current harvest schedules were projected by Oregon State University (See p. 21) and by the State of Washington (See p. 22). Under these schedules, future increases from high-level forest investment were rapidly reflected in harvest levels so that they did help to offset projected industry declines in the years just ahead. It is doubtful, however, that the projections used in the State studies

would meet a strict interpretation of the non-declining even-flow provision of the National Forest Management Act of 1976.

--On the economic effects of supply scarcities-- most of the studies reviewed dealt only sparingly with this subject, with the exception of an econometric analysis that projected supply and demand by explicitly accounting for market interaction. It found both timber prices and supplies rising considerably higher than was generally assumed by the Forest Service. (See p. 29.) This report projected a 10-percent loss in market share by the Pacific Northwest to other regions and imports and found that both price increases and market share losses could be offset if production in the region were substantially increased.

--On multiple-use and environmental effects-- the studies also analyzed the effects of increased production on other uses of the forest and on the environment (Chapter 6). Here GAO notes that the Forest Service assumptions were generally land-extensive, i.e., forest management techniques were to be applied uniformly over all eligible lands before more intensive methods were applied to any. Similarly, the assumptions made in the State studies involved more intensive management over large areas. The Forest Service concluded that even its own proposals for intensified cultivation could have adverse effects on other uses of the forests, and GAO thinks the State studies implied similar effects.

A recent non-Government study by a timber authority proposed an alternative, dominant-use concept whereby the forests would be managed by specializing sites--the best timberlands would be managed intensively for timber production, and other sites would be reserved for those uses to which they were best suited. Proponents of dominant use maintained that, in general, all uses of the forests would increase, even though some might be diminished on particular sites. (See p. 36.) GAO found that the economics of

the Douglas-fir region seemed to favor the dominant-use idea.

How would increased forest management affect the environment? A Forest Service study found potentially significant environmental damage could result while a Presidential panel found that increased timber production need not cause environmental damage. GAO concludes that these conflicting findings were reached on different assumptions about how timber operations were to be conducted. GAO also notes that environmental damage as currently dealt with by numerous jurisdictions under varying laws and regulations is not as yet well defined.

The studies reviewed were, for the most part, well-integrated and consistent with the assumptions made and the purposes for which they were intended. They raised enough unanswered questions about forest policy to justify reexamining a number of its aspects.

AGENCY COMMENTS AND GAO RESPONSE

Forest Service officials agreed the situation needed reexamination and said that the Department of Agriculture was currently reviewing harvest policy with the view to choosing one of three possible options:

- Continue strict nondeclining (even) flow (the present policy).
- Increase harvests within the constraints of the National Forest Management Act of 1976.
- Seek new legislation to further liberalize the current policy.

Any further comprehensive analyses of the overall supply situation, the Forest Service thought should be done through the periodic assessments now required by law. The analysis of the site-specific environmental effects of timber operations should be done through an individual forest's planning system. GAO believes that decisions on harvest policy should not be made separately from a broader

analysis of the supply situation and environmental effects. GAO cites previous reports it has issued on the shortcomings of past Forest Service studies as input for public policymaking.

RECOMMENDATIONS TO THE AGENCY

The Secretary of Agriculture should prepare a single, comprehensive study for the Congress, evaluating the effects of alternate harvest and timber management policies on the economy, environment, and nontimber uses of the national forests. Such a report should recommend one of the options outlined in the Forest Service Chief's letter. If the Secretary of Agriculture recommends continuing a strict, nondeclining even-flow harvest policy, GAO recommends that a reasonably detailed explanation be given.

MATTERS FOR CONSIDERATION BY THE CONGRESS

As indicated above, the studies reviewed generally agreed that a projected decline in Pacific Northwest timber supply could be alleviated or averted through some combination of increased investment, changes in the harvest schedules, and changes in multiple-use practices of the national forests. This in turn would, of course, require increased Federal expenditures and, it appears, changes to the National Forest Management Act of 1976--both matters for the Congress to decide.

GAO indicates in this report the additional questions it thinks need to be answered in arriving at a sound legislative decision. GAO also points out that some of the seemingly more innovative ideas on these subjects were found in the studies made by timber experts outside the Forest Service. Furthermore, those individuals strongly opposed to more intensive forestry solely for environmental reasons were not represented in any of the studies. GAO believes these additional views would be useful in arriving at a balanced reconsideration of national forest legislation.

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CHAPTER 1

INTRODUCTION

Concern has been growing during the last several years about possibly serious timber shortages in the Douglas-fir region of the Pacific Northwest (western Washington, western Oregon, and parts of northern California). It is a regional concern because the timber industry is important to the local economy, but it is also a national issue because the Northwest is a major supplier of lumber and other wood products.

The problem was brought to light in a series of timber supply forecasts by the U.S. Forest Service, the most notable being the official, 10-year timber census, "Outlook for Timber in the United States," published in 1973. Since then, the projected shortage has been the subject of numerous studies by the Forest Service and independent parties.

Since large tracts of the richest timberlands in the region are publicly owned and many are governed by Federal law, it is natural that questions about timber management in the area would become matters of public debate. Moreover, the many studies done on the subject, while adding considerable information to the deliberations, tended also to confuse the issue because they seemed to reach different conclusions, often on the basis of differing assumptions, data, and methods.

This report is an analysis and critique of what are considered some of the major studies of forecasted timber supplies in the Pacific Northwest Douglas-fir region. It is intended to be of assistance in policy analysis concerning national forest timber management. The report does not address timber management of private, State, or other Federal timberlands.

SCOPE

We were requested by the chairman of the House Committee on Interior and Insular Affairs to prepare a comprehensive critique of a number of studies that focused on timber supply problems in the Pacific Northwest Douglas-fir region. The chairman was concerned with the prospects of a timber shortage in the region and its possible effects.

Three studies from the chairman's original request are not dealt with in this report because we considered them

outdated or not directly relevant. On the other hand, we added four that were not readily available earlier but which were, in our view, especially relevant to one or more of the committee's concerns.

The following chapters present a critique of the studies most pertinent to public concerns. Those studies, or parts of studies, which dealt with a single issue are discussed together in a comparative context.

The 11 studies cited and discussed in this report are listed and discussed in table 1 (p. 3), for ready reference.

TABLE 1
Studies Cited and Discussed in This Report

| <u>Title</u> | <u>Date</u> | <u>Content</u> |
|--|-------------|---|
| <u>Studies Cited for Review by the Committee</u> | | |
| 1. <u>The Outlook for Timber in the United States, Forest Service, USDA.</u> | 1973 | 1. One in a series of timber appraisals made periodically by the Forest Service relating primarily to the Nation's 500 million acres of commercial timberland. Dwindling supplies in the Pacific Northwest industrial lands and increasing demands were dealt with in some detail along with rising prices. Increased demand for additional recreational acreage was also discussed in the 367-page report. |
| 2. <u>Douglas-Fir Supply Study, Forest Service, USDA.</u> | 1969 | 2. Examined alternative programs for increasing timber supplies in the Pacific Northwest region as a response to the expected decline in timber yield from private timberlands in the next 20 to 30 years. |
| 3. <u>Two Projections of Timber Supply in the Pacific Coast States, Forest Service, USDA.</u> | 1975 | 3. Used two projections of timber supply up to 2020 in western Oregon, western Washington, California, and Alaska. One projection indicated how much timber would be available if forest management continued at its present level. The other showed the increased supply due to a 10-year intensification plan. |
| 4. <u>Washington Forest Productivity Study: Phase I and II, Washington State Department of Natural Resources</u> | 1975 | 4. PHASE I Examined timber supplies now and in the future in Washington from the standpoints of biological potential and successively higher levels of forest management. |
| NOTE: Only Phase I was listed in the Committee request. Phase II added by GAO. | 1976 | PHASE II Indicated that the projected decline in timber supplies for the next 20 to 30 years could be eliminated by a combination of intensified management and revised harvest schedules. Both would appear to require changing current Forest Service policy. |
| 5. <u>Report of the President's Advisory Panel on Timber and the Environment, Government Printing Office</u> | 1973 | 5. Examined potential productivity of the national forests with the purpose of also protecting the environment. Study commented on other analyses of increased forest management and harvest schedules and made recommendations to change forest policy. |
| 6. <u>Alternative Log Export Policies for the Long-Term: Phase II Report, Stanford Research Institute</u> | 1974 | 6. Assessed the need and feasibility of alternative log export policies in the long-term for the Pacific Northwest region. |
| 7. <u>Employment Implications of Projected Timber Output of the Douglas Fir Region, 1970-2000, Forest Service, USDA.</u> | 1973 | 7. Projected that the decrease in timber supplies in the Douglas Fir region, under a continuation of present levels of forest management would cause a possible drop in employment in timber-related industries. |

Additional Studies Reviewed by GAO

- | | | |
|---|------|---|
| 8. <u>Timber Harvest Scheduling Issues Study</u> , Forest Service, USDA | 1976 | 8. Comprehensive analysis made by the Pacific Northwest Forest Experiment Station of alternative methods for scheduling harvests on public timberlands to compensate for the increased demand and reduced supply. Scheduling alternatives were consistent with the Multiple Use-Sustained Yield Act of 1960. Study investigated changing the size of the area to be harvested to increase yields overall. |
| 9. <u>Timber for Oregon's Tomorrow, an Analysis of Reasonably Possible Occurrences</u> , Oregon State University | 1976 | 9. Analyzed timber supplies under two different harvest schedules and two rates of management intensification. |
| 10. <u>Impacts of National Forest Timber Harvest Scheduling Policies on Softwood Stumpage, Lumber, and Plywood Markets: An Econometric Analysis</u> , Oregon State University | 1976 | 10. Examined the possible effects on prices, consumption, and production of lumber and plywood of alternative national forest harvest schedules, the only study that projected supply and demand by explicitly accounting for market interaction. |
| 11. <u>The Economics of National Forest Management</u> , Resources for the Future | 1976 | 11. Concentrated on improved techniques for managing the Nation's forests. Introduced the concept of dominant use, i.e., designating certain sites for intensive management and less productive sites for nontimber uses. |

CHAPTER 2

WHAT IS THE PACIFIC NORTHWEST TIMBER

AVAILABILITY PROBLEM?

All of the studies examined in this report dealt in one way or another with projected scarcities of timber grown in the Pacific Northwest, Douglas-fir region. The studies agreed that, if current practices are continued, the supply of timber products over the next few decades would not be able to keep pace with increased demand.

The implications of this forecast are serious. Lumber prices, which historically have risen faster than the general price level, will probably continue to rise rapidly in the future--and with significant social costs. An important basic material, wood, will probably cost more and be used less. Further, most of the studies projected an absolute decrease in supplies, which could adversely affect regional employment, income, and the local tax base.

Almost all the studies focused on increasing timber supplies to solve the problem, and most agreed that an adequate increase could come from Federal lands without seriously depleting them. The studies differed greatly, however, on whether and how this should be done. Some of the studies confined their coverage to existing policies and laws while others implied definite changes to the current statutes.

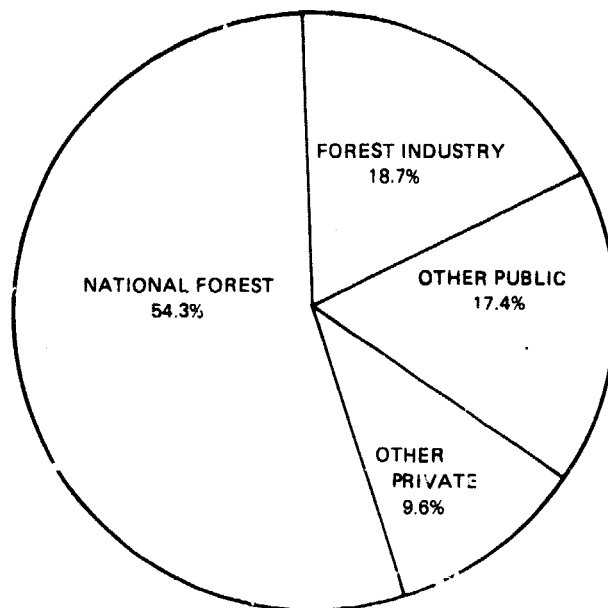
As a group, the studies raised most of the important issues currently affecting national timber policy and Federal forest management. These included the amount of cutting that should take place on Federal lands, the degree of desired investment in forest resources, the complicated trade-offs between logging and other uses of the forest, and environmental issues in general. In analyzing the studies for the purpose of formulating public policy, this report necessarily deals with all these issues.

THE PACIFIC NORTHWEST SUPPLY PROBLEM IN PERSPECTIVE

The studies discussed in this report concentrate, with good reason, on timber supply in the Pacific Northwest Douglas-fir region and particularly emphasize the publicly-

owned timberlands. Northwest timber is 96-percent softwoods--fir, pine, and hemlock--of the type used in lumber and plywood for the Nation's homes, other construction needs, and paper products.^{1/} The Northwest, although it contains only 12 percent of the Nation's commercial-grade forest lands, accounts for 51 percent of the softwood inventory and 45 percent of annual production. About 72 percent of the region's inventory is publicly owned, 54 percent (see fig. 1, below) being under U.S. Forest Service management.

FIGURE 1
NORTHWEST TIMBER INVENTORY
(BY OWNERSHIP)



SOURCE: *OUTLOOK FOR TIMBER IN THE U.S.*

Public ownership has contributed to the region's sizable stock of old-growth (uncut) forests, because cutting has been governed more by public policy stressing conservation than by market forces. Ever since the Forest Reserve Act of 1891

^{1/}Unless otherwise indicated, all figures in this report are based on 1970 statistics as presented in "The Outlook for Timber in the United States," U.S. Forest Service, Oct. 1973.

and the conservationist policy of President Theodore Roosevelt, the region's forests have been protected against unregulated commercial use. The total area reserved for public forests today--about 200 million acres--is about the same as it was around the turn of the century. And the Pacific Northwest region is one of the last major timber areas still containing virgin forests.

Most of the Nation's timber demand was met from reserves on private lands until World War II. During the 1920s and 1930s the national concern was to maintain prices at a level that would support a healthy timber industry and guarantee an adequate future supply. During this time management of the national forests was largely custodial--controlling fires, regulating grazing and mining, and supervising timber sales.

The Forest Service's nondeclining even-flow cutting policy, intended to conserve a maximum inventory of trees--a policy discussed throughout this report--originated from this prewar period. It was intended to limit production in the national forests to maintain acceptable price levels which would, in turn, encourage reforestation by private owners.

The rapid expansion in housing and other construction during and after World War II, however, caused a long and sustained rise in lumber prices and an awareness by the 1960s of an impending shortage that is the subject of most of the studies reviewed here. At the same time, increased environmental concerns have created conflicting pressures.

The current harvest policy was a response to projected declines in the timber inventory on Federal lands. It calls for harvest schedules wherein the amount of timber cut during a specified time will be offset by new growth to avoid any decline in timber inventories. Under this policy cutting trees on Federal lands has been spread over several hundred years. The policy was later affirmed by the National Forest Management Act of 1976.

The National Forest Management Act states that harvests can be increased only if other forest uses are not diminished. It also requires the Secretary of Agriculture to

"* * * limit the sales of timber from each national forest to a quantity equal to or less than a quantity which can be removed from such forests annually in perpetuity on a sustained yield basis * * * ."

The act permits increases in harvest levels, however, based on intensified management practices such as reforestation,

thinning, and tree improvement, but only if such practices can be justified in accordance with the objectives of the Multiple-Use Sustained-Yield Act of 1960. But these harvest levels must eventually be decreased at the end of each planning period. The act allows departure from the policy only for salvage or sanitation harvests of damaged or threatened timberstands or to meet multiple-use objectives.

Except for multiple-use objectives (which are not entirely clear) the only way harvests can be increased is by more intensive cultivation practices. That is why those cultivation practices received considerable attention in the studies, especially in the Forest Service studies.

WHY SUPPLIES ARE BECOMING SCARCE

All of the studies reviewed found that increased needs for timber from the Pacific Northwest could not be met while continuing current practices, and many studies projected definite production declines unless changes were made. The cause of the declines has to do with exhaustion of old-growth forests on which the timber industry has traditionally relied and their replacement by smaller regenerated trees. Old-growth forests typically contain trees well over 100 years old, which are of a size to yield the maximum wood per acre. Regenerated forests contain younger, smaller trees that naturally contain less wood.

Most of the old-growth forests on private lands in the Pacific Northwest, which in 1970 accounted for more than half of total timber production, have been cut. In the future the region will have to rely on regenerated forests, which is why there is a projected decline in overall production. As indicated in one Forest Service study (see p. 13 of this report), this same exhaustion of and conversion from old-growth forests would eventually occur on public lands as well.

HOW TO DEAL WITH OLD-GROWTH CONVERSION

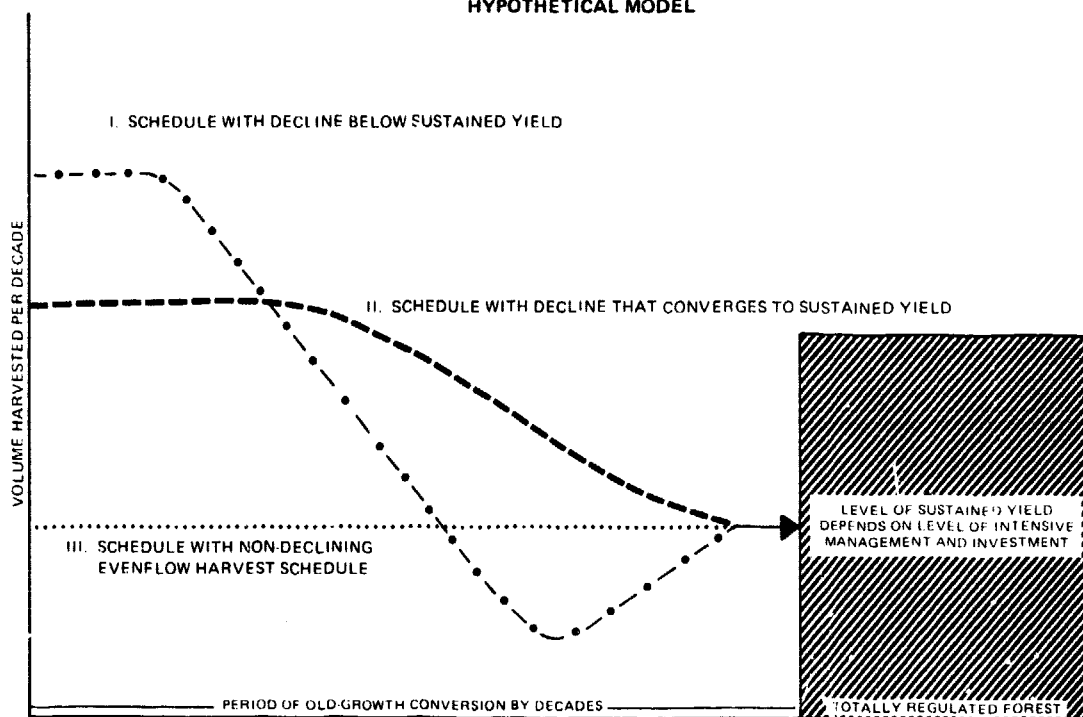
Converting from old-growth to regenerated forests while meeting increased timber demands was the focus of most of the studies. All agreed that in the long run (over at least 50 years), production could be increased through more intensive forest cultivation, although the studies disagreed over whether this should be done and, if done, on what sites.

The studies also dealt with the more immediate harvest question of how to maintain or increase supplies now. This

was discussed in terms of possible increased cuts on public lands, since that is where 70 percent of the current timber inventory stands. A number of cutting levels were projected, and all aimed at yields that could be sustained at some rate (depending on the degree of forest investment) indefinitely.

Some of the scheduling options considered are illustrated in Figure 2:

FIGURE 2
ALTERNATE HARVEST SCHEDULE
HYPOTHETICAL MODEL



Schedules I and II allow for increased cutting now (which would compensate for a reduced private yield while private owners were adjusting to the depletion of their old-growth timber) and then reach a new yield level that could be sustained indefinitely from regenerated forests. Schedule I approximates the actual experience in the Southeast timber region, where harvests initially declined before returning to their present levels. Schedule III shows Forest Service policy as codified by the National Forest Management Act of 1976. It spreads old-growth harvests over several hundred years in order to sustain yields from the public forests at current levels, but does not compensate for the reduced private yield during the conversion period.

OTHER ISSUES IN THE STUDIES

The studies raised a number of long-term forest issues in addition to projected scarcities during the old-growth conversion period. Current policy is based on minimizing environmental damage and promoting multiple uses of the forest.

Critics of this policy, however, maintained that timber production could be increased, not only now but in the future, by implementing a higher old-growth harvest level. They claimed that this would reduce the loss of old-growth trees to fire and natural mortality while making more land available for new growth. (See fig. 3 on p. 11.) These critics pointed out that, although the younger forests contain less timber per acre, they nevertheless grow faster, thus adding more wood to the inventory and that cutting more often would increase the total supply.

The critics also challenged the assertion that more flexible harvest schedules would necessarily damage the environment more than present policies.

The Forest Service now uses a single National Forest (a geographical area of administration) as the planning unit in setting harvest levels. One of its studies (see p. 19) considered using a larger region as the planning unit, thus allowing more flexibility in the harvest levels of the individual forests. Finally, one study questioned the Forest Service's current multiple-use policy. (See p. 36.)

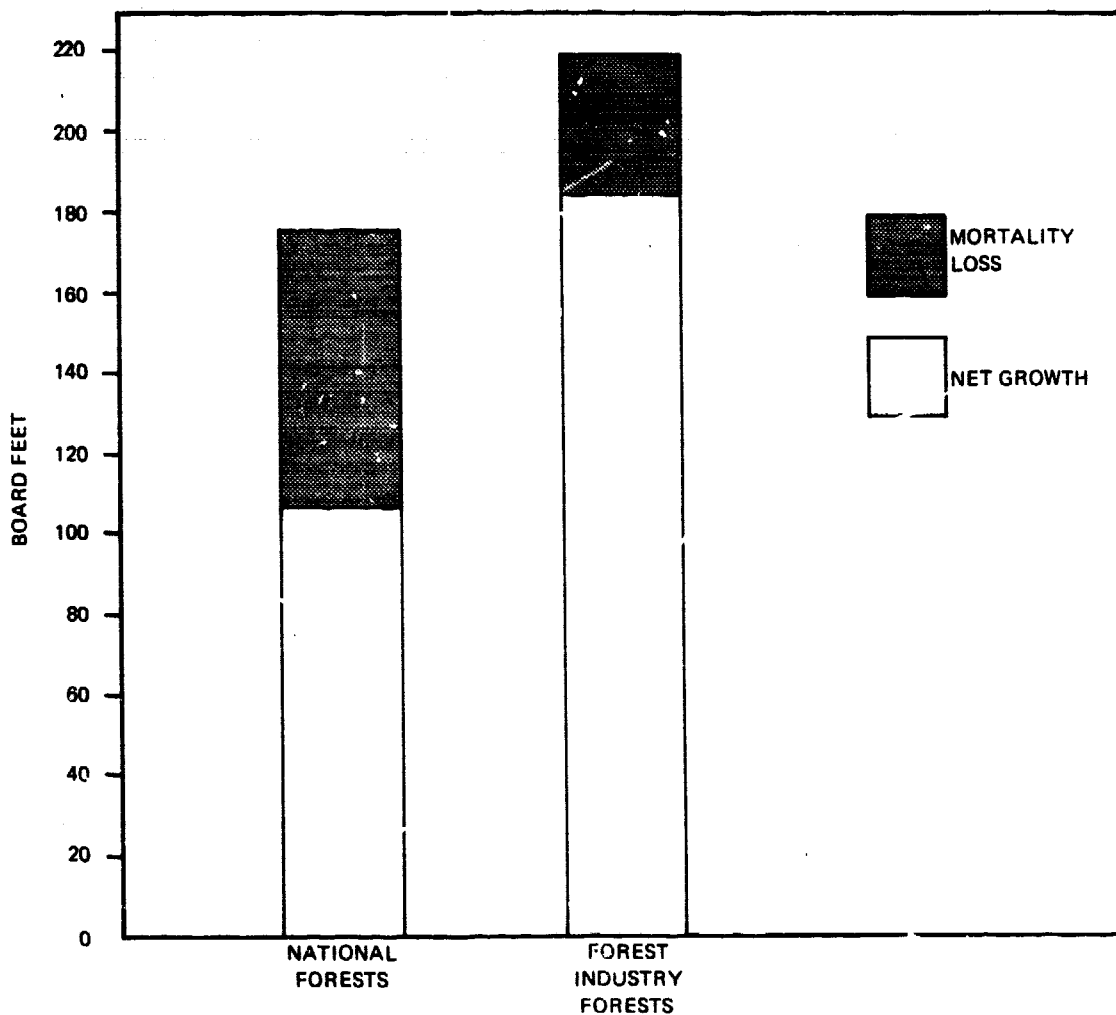
THE 11 STUDIES REVIEWED

Each of the 11 studies reviewed in this report is discussed in the chapters that follow as it relates to the principal forest issues described above. Chapter 3 discusses three Forest Service reports that showed projected inventory shortages under current policy, and examines the effect of increased investment in forest cultivation without a change in harvest policy. Chapter 4 examines three additional studies (one by the Forest Service, one by Oregon State University, and one by the State of Washington) that analyzed the effect of varying harvest schedules--some in ways that would require changes to the law.

Chapter 5 considers the possible economic effects of inventory projections, as discussed in the official Forest Service's Outlook report versus an independent study. Chapter 6 discusses issues raised in previously mentioned reports along with the additional views of a Presidential panel

and an independent forest expert. Chapter 7 gives our views on the policy questions not answered in any of the reports and indicates what remains to be done.

FIGURE 3
GROWTH/MORTALITY LOSS FORESTS – 1970
(PER ACRE)



SOURCE: *The Economics of National Forest Management*

CHAPTER 3

COULD INTENSIVE MANAGEMENT OF THE NATIONAL FORESTS SOLVE THE PROBLEM?

The earliest Forest Service study that projected a decline in the Pacific Northwest timber inventory was the 1969 "Douglas-Fir Supply Study," which led to the Forest Service's current harvest policy in the region. The second is the "Outlook for Timber in the United States" which, based on 1970 statistics, is the official long-range Forest Service survey. All of the other studies discussed in this report, and this report itself, relied heavily on the Outlook data. The third study, "Two Projections of Timber Supply in the Pacific Coast States" (1975), concentrated on the effects of more intensive cultivation for present and future timber harvests.

The "Douglas-Fir Supply Study" was the earliest study in this group that highlighted an inventory decline. The other two are more recent projections of an inventory decline on private lands over the next two to three decades. All the base projections were made under the assumption that management and harvest practices would not change in response to market conditions, although the effect of assumed increases in forest cultivation was considered in several projections.

As such, these base projections are not realistic forecasts of what will probably happen. If there were to be a serious shortage, prices would surely rise and timberland owners and processors would undoubtedly react to new profit opportunities. Also, at least one industry study challenged the common assumption by most of the studies reviewed--that there would necessarily be a decline in the amount of timber cut on private lands. (See p. 24.) These broader economic considerations are discussed in some detail in Chapter 5.

Aside from that, the supply projections in the three Forest Service studies highlighted some of the probable consequences of the trend to greater reliance on smaller, regenerated trees. They also discussed how this might affect public forest policies.

METHODS OF INTENSIFYING FOREST CULTIVATION

As mentioned in chapter 2, the National Forest Management Act of 1976 permits increases in harvest levels on Federal

land, based on "intensified management" practices that would allow higher levels of sustained yield. (See p. 7.) Most of the studies discussed in this report attempted to measure the effect of such practices for given harvest scheduling policies. The main forest cultivation practices are described below. All practices would depend on increased investment on private lands or increased Federal expenditures on public lands. To the extent that the increased cultivation would allow increases in timber sales, such sales would offset additional appropriations. The cultivation methods are:

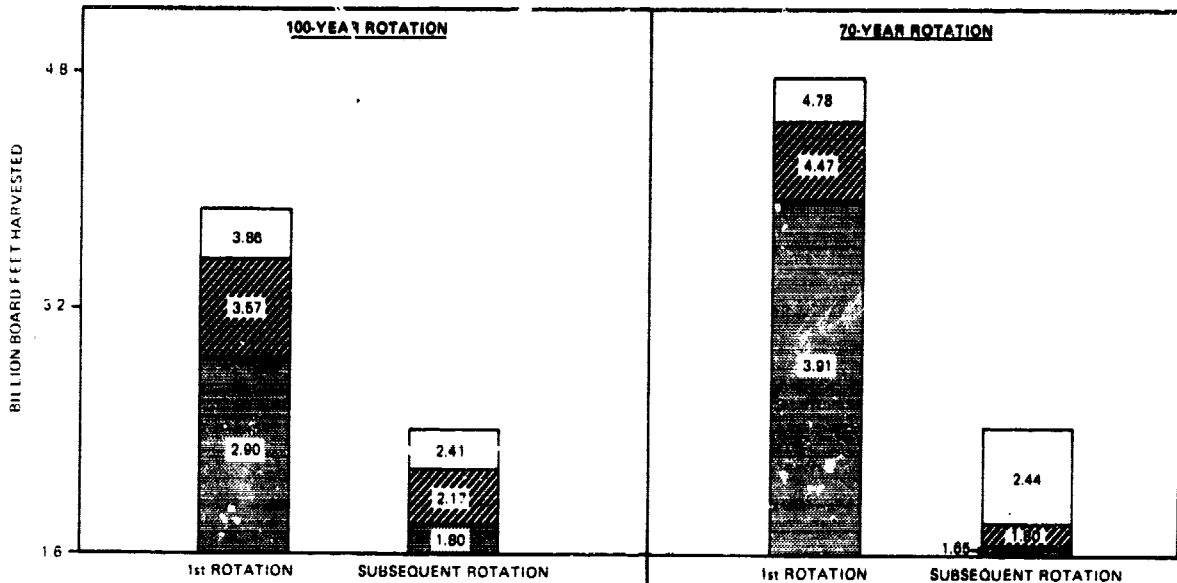
- Reforestation/regeneration; preparing and replanting on denuded or understocked forest lands.
- Commercial thinning; concentrating growth on the more valuable trees by harvesting and marketing some less desirable trees before maturity.
- Stocking control/precommercial thinning; eliminating competing vegetation to provide more growing room for the most desirable young trees.
- Mortality salvage; harvesting trees that have been killed or damaged by fire, insects, or disease.
- Fertilization and genetic improvement; adding nutrients to the soil to enhance timber growth and carefully propagating seedlings from superior trees. This practice was not generally assumed in the studies.

All of these techniques could be implemented to increase inventories of regenerated trees. In each case, though, the current costs incurred must be balanced against the expected returns from future harvests. Such resource allocation is what is generally meant by intensive management--as opposed to relying on natural generation and growth.

THE "DOUGLAS-FIR SUPPLY STUDY"

The 1969 "Douglas-Fir Supply Study" was undertaken to investigate the possibility of increasing harvests on Federal lands by (1) increasing forest cultivation and (2) shortening the periods between cuttings from the current 100 years to 70. This was one of the first computer simulations done on the subject. As shown in figure 4, (see p. 14) the "Douglas-Fir Supply Study" projections indicated that shortening the period between cuttings would result in lower subsequent harvests, regardless of the investment in more intensive forest cultivation. More surprisingly, they showed only slightly less decline when the 100-year period was continued.

FIGURE 4
 RESULTS OF DOUGLAS-FIR SUPPLY STUDY
 BY DEGREE OF CULTIVATION (LOW ■, MEDIUM ▨, HIGH □)



Thus the Forest Service, while seeking to offset a current decline in private timber supplies, discovered a similar future decline in supplies from the national forests. The decline would result from the Forest Service policy of establishing an even flow of cutting over the harvest period (100 years). This would automatically lead to a decrease once the older trees were exhausted. As already explained (see p. 8), this is a natural consequence of the shift to smaller second-growth trees, and it led to the Forest Service's current, more conservative policy of spreading the old-growth harvests over much longer periods. The even-flow policy would indeed avert a decline in the 21st century but would lower average harvests during the first decade and, therefore, increase the likelihood of regional timber shortages over the next 30 years. As with several other studies, the "Douglas-Fir Supply Study" projected increased harvests in all cases, according to the amounts invested in more intense forest cultivation.

"THE OUTLOOK FOR TIMBER IN THE UNITED STATES"

Based on 1970 data the official Forest Service Outlook projected timber supply and demand through the year 2000 and, in the case of supply, 20 years beyond that. The demand projections are considered further in chapter 6 of this report. It is pertinent to note that the Outlook projections for the Pacific Northwest timber supply dropped 18 percent below 1970 levels by the year 2000 as shown in figure 5; the decrease is attributed to a decline in timber from private lands. Supplies would then remain steady through 2020.

The definition of sawtimber used in these projections excluded trees with diameters less than 11 inches. For reasons explained in chapter 6 (see p. 37), Douglas-fir stands are normally clearcut, meaning that all trees--small and large--are removed in a given area. Furthermore, some timber processors now use trees with a diameter as small as 4 inches.

FIGURE 5
SAWTIMBER SUPPLIES
(TREES WITH 11-INCH DIAMETER OR MORE)

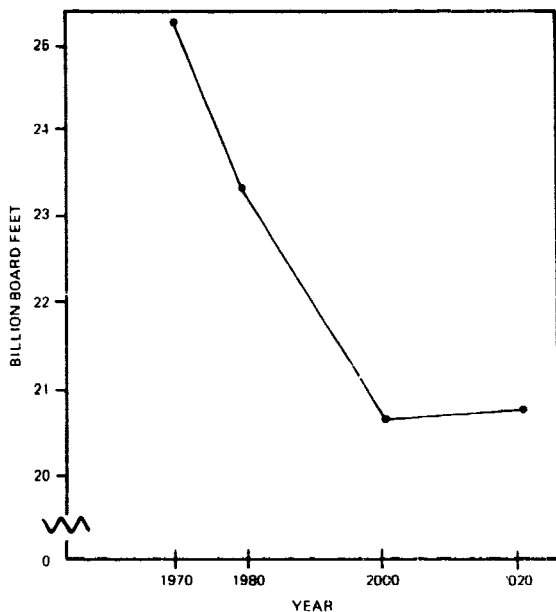
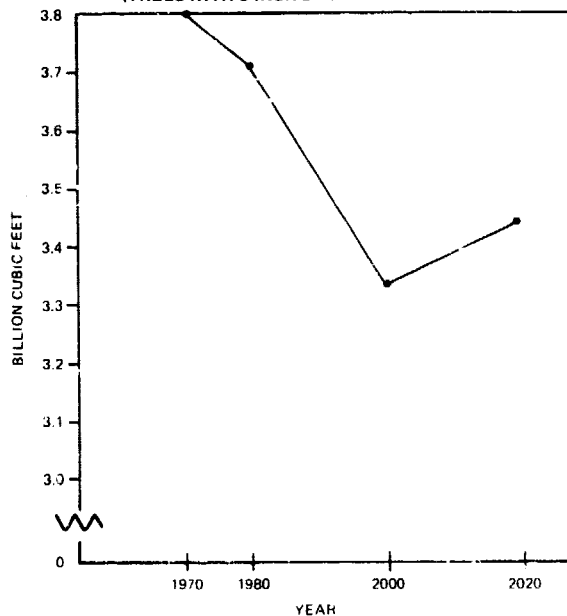


FIGURE 6
ROUNDWOOD SUPPLIES
(TREES WITH 6-INCH DIAMETER OR MORE)



SOURCE: OUTLOOK FOR TIMBER IN THE U.S.

The Forest Service roundwood projections (see fig. 6, p. 15), which included all trees 5 inches or more in diameter, showed only a 13-percent decline through the year 2000 and some increase after that. Thus, as much as 5 percent of the projected decrease in Outlook's projected supplies may simply result from the way commercial timber is defined.

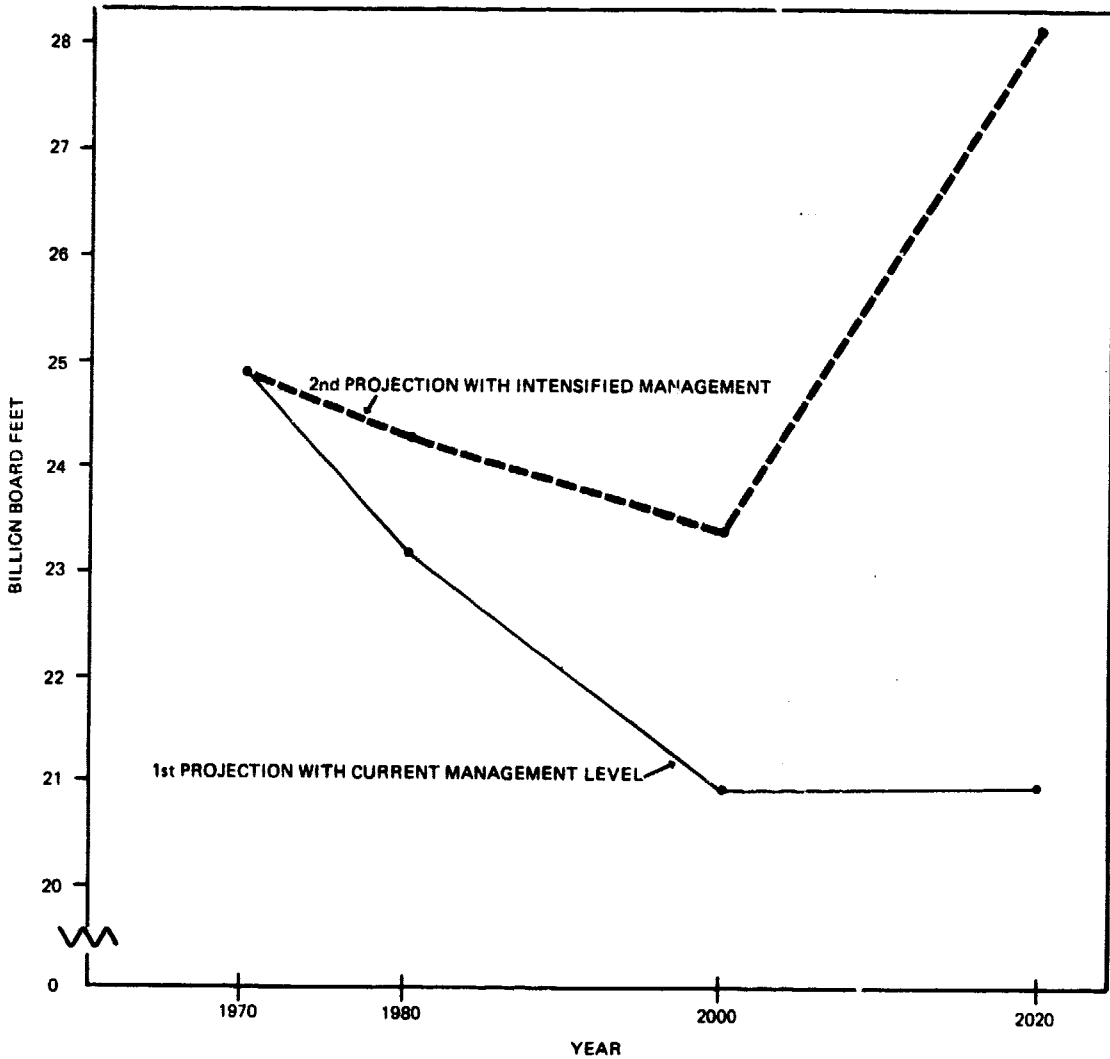
"TWO PROJECTIONS OF TIMBER SUPPLY
IN THE PACIFIC COAST STATES"

Under the Forest Service's even-flow policy, the amount of timber cut on public lands can be increased only in response to more intense cultivation, which in time leads to higher yields.

The Two Projections study was an attempt by the Forest Service to show the effect of such cultivation in increasing the timber supply. The first projection, shown in figure 7, (see p. 17), graphs a continuation of current practices without additional investment. It is essentially the same as Outlook's projected sawtimber decrease shown earlier in figure 2. Figure 7 also shows in the second projection the comparative results of a 10-year intensified cultivation program. The second projection assumed a slight decrease over time in regional acreage devoted to timber and a gradual trend toward use of 5-inch diameter roundwood trees. It also assumed a somewhat greater use of logging residue, but no change in rotation length (the time between cuttings on the same land). The second projection's harvest levels were assumed to increase by a 10-year investment program on all land the Forest Service thought was capable of a 5-percent or greater increase in yield. This assumed--somewhat unrealistically we think--that private and other public landowners would necessarily follow the Forest Service's investment program and timing.

The projected results of the program were: a 4-percent increase in 1980, over 10 percent in 2000, and peak response after that.

FIGURE 7
RESULTS OF TWO PROJECTIONS OF TIMBER SUPPLY IN THE PACIFIC COAST STATES STUDY
(1970 SUPPLY = 24,912 MILLION BOARD FEET)



CONCLUSIONS

None of the significant increase would occur in the 1980 to 2000 period of currently projected shortages from private timber harvests because timber produced from the cultivation program wouldn't mature until the middle of the next century. Consequently, intensive management, by itself, cannot solve the problem.

CHAPTER 4

SHOULD THE HARVEST POLICY BE CHANGED?

The current Forest Service policy of even-flow cutting is justified on grounds that it provides more economic stability and is less damaging to the environment than alternate harvest schedules. Even-flow harvest policy is also said to provide greater protection against unforeseen future losses of land area devoted to timber and unpredictable changes in timber growth and processing techniques.

The critics of even-flow centered their argument on the fact that timber is a renewable resource and pointing out that it cannot be renewed until mature and overmature trees are cut. They stressed that old-growth forests add little to new growth, are much more susceptible to natural mortality, and limit the acreage available for the regeneration of younger trees.

Variations of the even-flow policy were studied by the Forest Service, by Oregon State University, and the State of Washington. Timber supply projections from all three studies are presented in this chapter.

The State studies showed the potential for a marked near-term increase in timber production, but implied that a change in Federal statutes would be required. The State studies, moreover, having been done outside the Forest Service, constituted the most comprehensive, independent projections of potential Northwest timber supply available. They were not completed, however, until 1976, hence were not readily available during formulation of the National Forest Management Act of 1976.

"TIMBER HARVEST SCHEDULING ISSUES STUDY"

In this study the Pacific Northwest Forest Experimental Station considered several alternatives to even-flow cutting. Some were defined in terms of the area harvested or the financial criteria used, but most considered variations in the average volume of timber cut over a given planning period. One study allowed for a 5-percent decline in average annual harvests from one decade to the next, while a second allowed up to a 10-percent variation in the cut from one decade to another, but required an even flow over the entire planning period.

Table 2 (p. 19) shows the supply projections for the two alternative harvest schedules (compared to those from the

current even-flow schedule) and one that was used in the earlier "Douglas-Fir Supply Study." (See p. 13.) Projections A on the left assumed no increase in forest investment, while projections B on the right assumed an increased investment similar to the Douglas-fir and Two Projections Studies discussed in chapter 3.

TABLE 2

Harvest Scheduling Output Volumes
(As Percentage of (1), first decade)

| ALTERNATIVE | A Projections | | | | B Projections | | | |
|-------------------------------------|-------------------------|-----------------|-------------------------|---------------|--------------------------|-----------------|-------------------------|---------------|
| | Output - Low Investment | | | | Output - High Investment | | | |
| | First Decade | Conv. Period | Post Conv. Period | 30 Decades | First Decade | Conv. Period | Post Conv. Period | 30 Decades |
| 1. Non-declining Even flow * | 100 | 99 | 98 | 99 | 157 | 157 | 157 | 157 |
| 2. Conversion Period Even flow * | 105 | 104 | 96 | 100 | 158 | 158 | 156 | 157 |
| 3. 5% Declining | 137 | 106 | 99 | 102 | 193 | 170 | 154 | 160 |
| 4. 10% Fluctuating | 116 | 105 | 97 | 101 | 146 | 162 | 157 | 159 |

*Current harvest scheduling policy

**Harvest scheduling policy incorporated into "Douglas-Fir Supply Study."

Source: "Timber Harvest Scheduling Issues Study," Forest Service, United States Department of Agriculture, 1976.

The A projections without increased investment all showed an increase in the first decade with only a minor drop thereafter. In the case of the 5-percent declining schedule, the initial increase was a substantial 37 percent over the non-declining even flow. This would seem to support a reconsideration of the current schedules.

The B projections, with their increased investment, resulted in substantially increased production over the entire period but would require additional appropriations. The investment program would cover some 70 percent of the total land area considered. Such blanket application of forest investment has been widely criticized, but there was insufficient information in this study to weigh the costs and benefits of such a program. The general subject of forest investment policy is discussed in chapter 6.

One additional consideration in the "Timber Harvest Scheduling Issues Study" was the application of an even-flow cutting schedule applied to an area larger than a single national forest (the current planning unit). The larger planning unit would allow greater opportunity for balancing gaps in one area with gluts in another. The study investigated using a single even-flow schedule that combined all landowners in Douglas County, Oregon. It found an increased allowable

cut of 15 percent in the first decade, 5 percent in the conversion period, and 2 percent thereafter. Use of the larger planning unit appeared to improve the yield without increasing the investment or basic departure from even-flow scheduling. It depended, though, on sustained inventories on private lands not under Government control.

Overall, the figures show that with increased investment and a change in harvest schedules the output from national forests could be increased by some 62 to 70 percent during the old-growth conversion period. This would be more than enough to offset the projected decline in production during the same period on industrial lands.

ALTERNATIVES TO EVEN-FLOW SCHEDULES

The Forest Service projections discussed thus far were derived from a computer model called Timber-RAM. It used a single planning period over which harvests were averaged, or, as in the "Timber Harvest Scheduling Issues Study," were varied around the average according to some prespecified scheme.

The computer models used in the Oregon and Washington studies replaced the static planning period with a sequence of planning periods, each one decade long. These were linked by a set of conditions which the forest would have to continuously meet one rotation in the future. For example, for a 100-year rotation cuts in 1980-90 would be constrained by the projected condition of the forest in 2080-90. And cuts in 1990-2000 would be constrained by conditions projected for 2090-3000, and so on.

The effect of the sequence of one decade's allowable cut computations is to cause potential harvests to converge gradually to an even-flow schedule. During the convergence, however, harvest levels may either rise or decline from one decade to the next. These sequential methods embody the principle established by the Multiple Use-Sustained Yield Act of 1960 but would not, it appears, be able to meet a strict interpretation of the even-flow provisions of the National Forest Management Act of 1976.

One result of the schedules considered in the Oregon and Washington State studies was that the effects of increased forest investment were accounted for earlier, which would, in turn, offset the decline in industrial harvests. The State studies treated timber management as a continuous program that was phased in as older growth was

harvested and as that acreage became available for replanting and more intense cultivation. Future yields would continually be increased as more and more land became regenerated forests. In contrast, the Forest Service schedules averaged such yield increases over the entire rotation period of 100 years or more. Consequently, investments made in the latter part of the period had less effect on yields cut in that period.

THE OREGON STATE STUDY

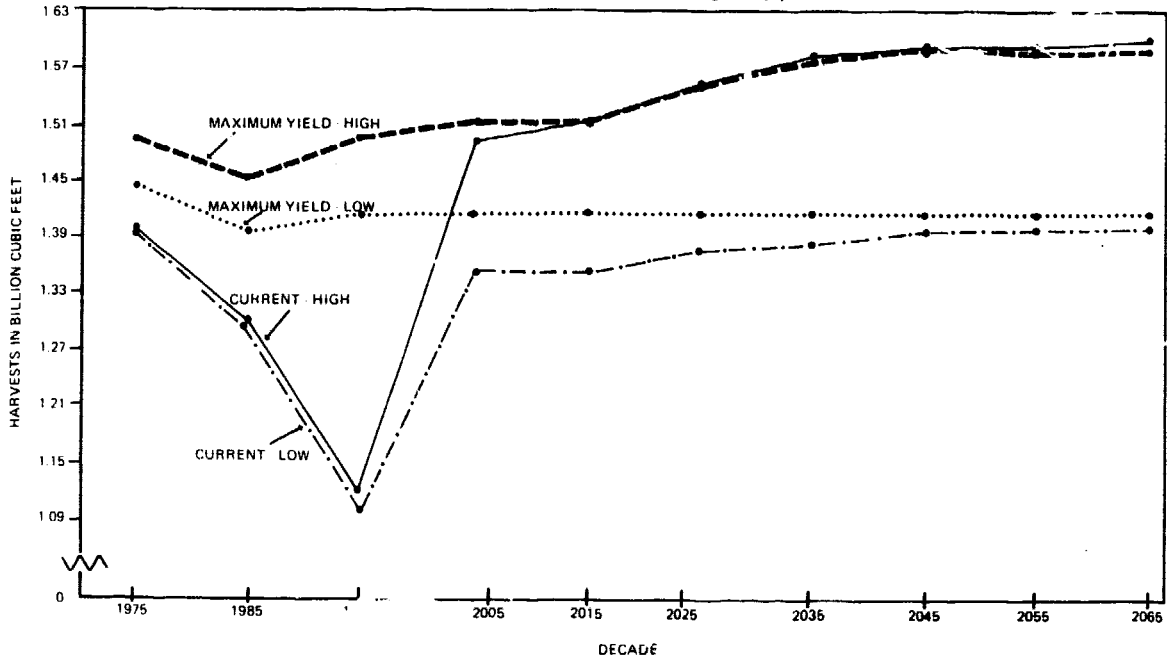
The 1976 Oregon State study--"Timber for Oregon's Tomorrow, An Analysis of Reasonably Possible Occurrences"--made projections under two harvesting schedules and two levels of forest investment. The first harvest schedule assumed that cutting on public lands would retain current even-flow schedules until the year 2000 and that private owners would provide the rest of the harvest needed to maintain future cuts at their mid-1970 level. The second schedule maximized harvests for all landowners by using the sequential method of converging to the long-run, sustained-yield level. Allowable cuts were projected over 100 years for each of two investment levels: Target A represented a plausible increase based on current trends, and Target B represented the maximum investment level considered practical by timber industry officials.

The Oregon State study assumed a greater shift of marginal land in the national forests to timber production by 2005 than did the Forest Service, and it assumed that fewer acres would be taken out of production. These assumptions were combined with the more conservative assumption that fully one-third of the timber inventory on private, nonindustrial lands would not be harvested. Thus, the study assumed a greater private harvest decline than did the Forest Service. The Oregon harvest projections included all trees of 7-inch diameter or more and therefore were more comparable to the Forest Service roundwood projections than to its sawtimber projections. (See p. 15.)

Figure 8 shows the results of the Oregon study on the following page. Figure 8 indicated a definite 22-percent drop in harvests over the next 20 years under the Current Low-Management harvest schedule assumption in Oregon's Douglas-fir region. The Maximum Yield High-Management harvest schedule by contrast showed harvest increases--6 percent through 1985, and as much as 14 percent in the year 2035.

Under the Maximum Yield harvest schedules, yields never dropped below the Current Level.

FIGURE 8
RESULTS OF OREGON STATE STUDY
(FOUR LEVELS OF FOREST MANAGEMENT)



The decline in harvests projected under the Current Low-Management schedule was somewhat greater than in the Forest Service projections, and the gains from shifting to revised harvest schedules were also greater. The projection from high investment, of course, showed greater yields than low investment, but the difference in yields was not as great as in the Forest Service projections. The Oregon projections, however, used a different base period and so are not strictly comparable to Forest Service projections.

"THE WASHINGTON FOREST PRODUCTIVITY STUDY:
PHASE I REPORT"

The Washington study combined sequential harvest scheduling techniques similar to Oregon State's; it had four

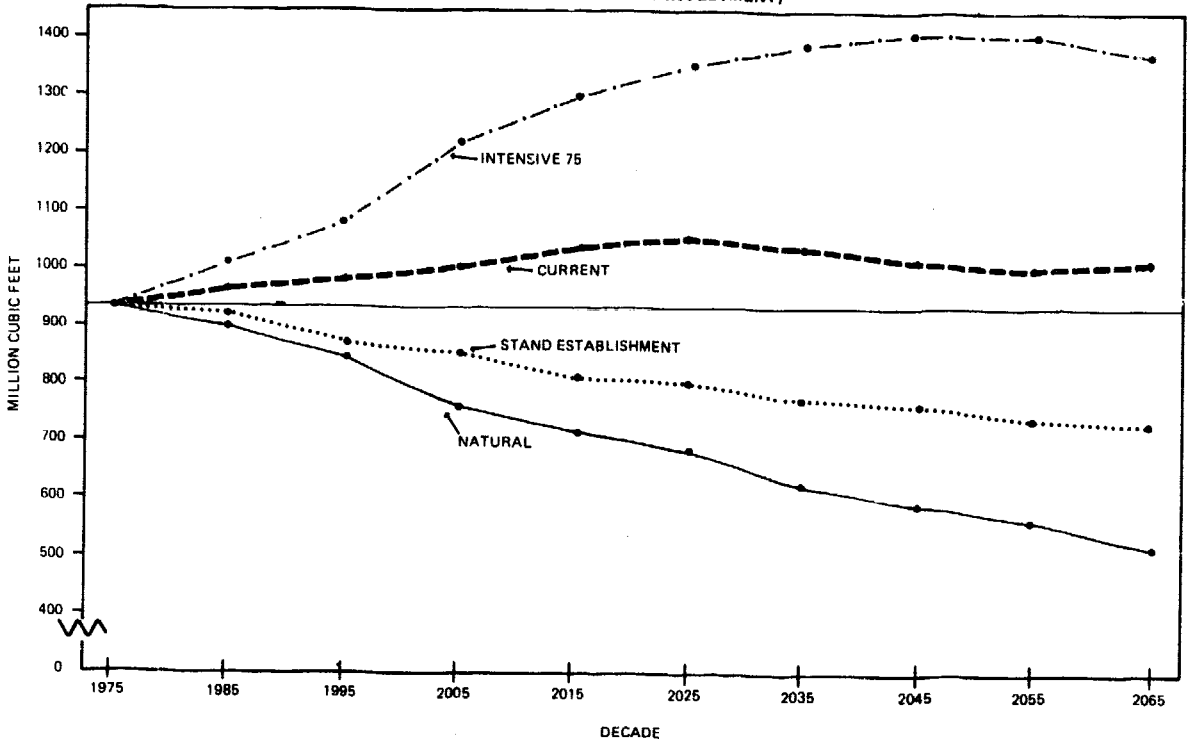
increasing levels of forest investment. The first two, labeled "Natural" and "Stand Establishment" (see fig. 9 on p. 24) assumed that clearcut acreage would be regenerated if the stands could yield, respectively, 50 and 85 percent of the current normal yield at harvest. These were both below current practice.

The third level, "Current," was the 1975 level of investment to be practiced by each ownership group, public and private. The highest level, called "Intensive 75," included the most productive management practices known in 1975, and were applied to all lands that were found to be technically and biologically adaptable. The only exception was commercial thinning (harvesting trees early to increase growth in the remaining stands), which was applied to only 90 percent of the possible forest area.

The Washington study allowed for substantial land withdrawals from timber production during the period of the projection. This amounted to an 11-percent decrease in the total land base for all ownership groups during a 70-year period. The results of the projection are shown in figure 9 on the following page.

The two least intensive investment levels showed steady declines from the second decade on. The more intensive levels showed steady increases until 2025, when they leveled off, but at a higher, sustained-yield harvest.

FIGURE 9
RESULTS OF WASHINGTON STATE STUDY, PHASE I
(FOUR LEVELS OF FOREST INVESTMENT)

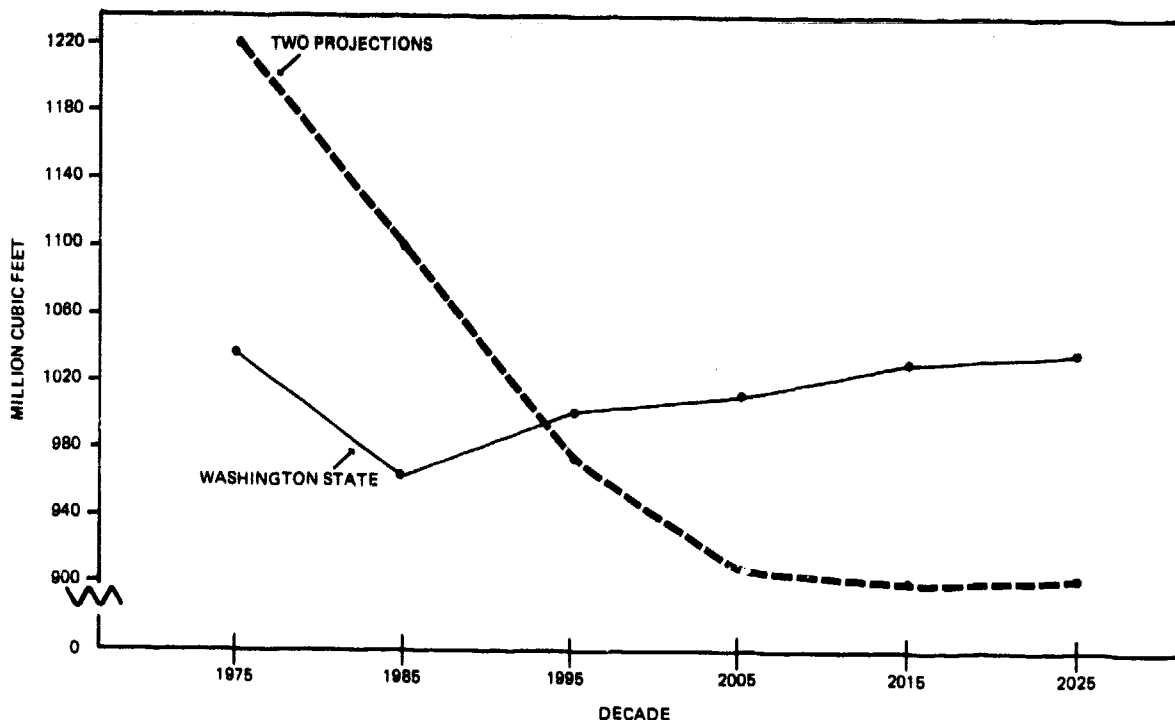


The projections by the Washington study, like most of the other studies discussed, included a sharp decline in the potential from timber industry lands. Some industry representatives maintained that this could be avoided entirely by more intensive cultivation. A comparison of the Washington study's "Intensive 75" projection with the Weyerhaeuser Company's High Yield Forest Simulation model indicates the difference to be a 34-percent greater yield under the Weyerhaeuser assumptions. Four percent of that difference was due to assumptions about future industry stocking levels, 17 percent to differences in yield assumptions, and 10 percent to differences in assumptions about regeneration lags. Of considerable significance to all studies discussed previously is the fact that the Weyerhaeuser projections showed no decline in harvests from industry lands.

REGIONAL INVENTORY PROJECTIONS COMPARED

We attempted to compare the projections of the Oregon and Washington studies with the Forest Service studies. (See fig. 10.) However, the difference in base years and standards of measurement used made strict comparisons misleading. The only quantitative comparison we could develop was between the Washington State and Two Projections studies at current management levels.

FIGURE 10
COMPARISON BETWEEN
WASHINGTON STATE AND TWO PROJECTIONS STUDIES



Although the studies indicated that a combination of increased investment and alternate harvest schedules on public land could avert the projected shortages, they did not establish that these practices would be economically or environmentally sound. These questions are discussed in the following chapters.

CONCLUSIONS

The Forest Service study (Two Projections) found a supply decline in the period from 1980 to 2020 in the Douglas-fir region. (See fig. 10.) The Oregon and Washington studies found that the decline could be averted by a combination of intensive timber management and revised harvest scheduling policies. The higher projections, however, would require fundamental changes in present policy and probably in the law itself.

Before such changes to harvest policy are considered, key questions--discussed in the following chapters--concerning the economic and environmental effects need to be addressed.

CHAPTER 5

WHAT ARE THE ECONOMIC IMPLICATIONS OF

REDUCED TIMBER SUPPLIES?

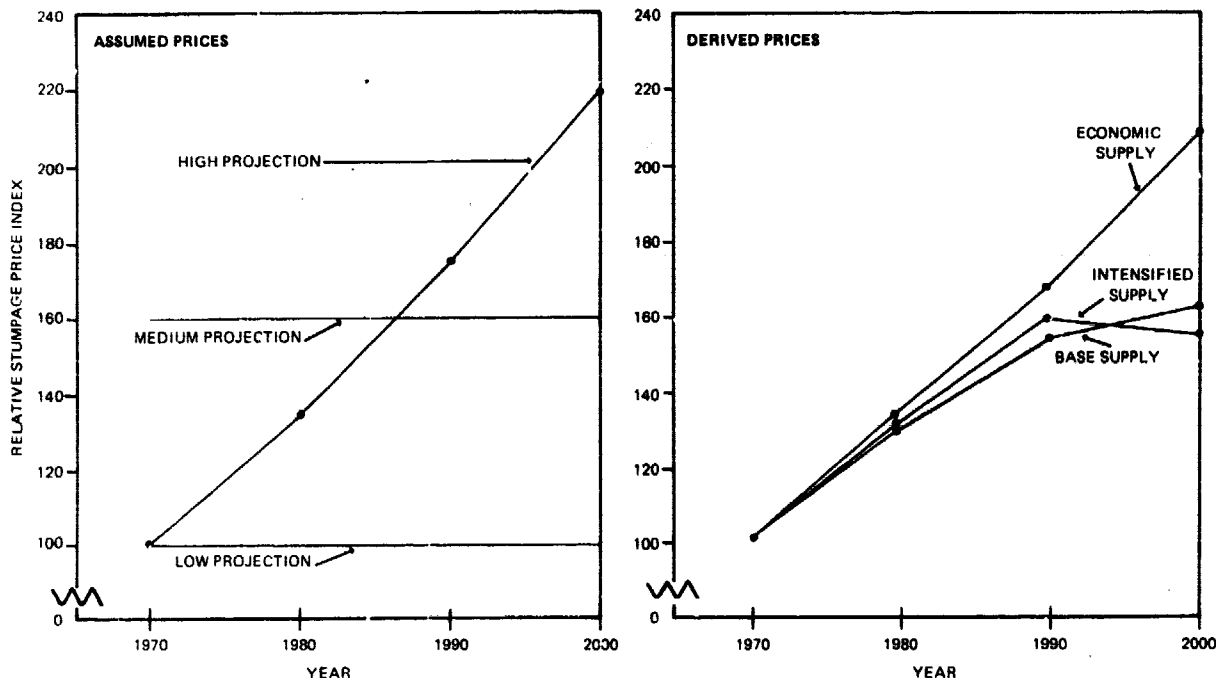
The concern of the studies discussed thus far over a drop in timber inventory is, of course, really a concern over its economic effects--on the prices and supply of timber products, and jobs, income, and taxes. The economic effects, in turn, are related not merely to timber inventories, but to the demand for forest products and how that demand is met in the marketplace. An examination of these problems must, of course, start with an analysis of the interaction between supply, demand, and prices. Surprisingly, this relationship was either ignored or inadequately covered in most of the studies reviewed.

The Outlook report contained supply and demand projections, but the price levels were merely assumed. This chapter attempts to relate Outlook's demand projections more directly to supply and price in order to derive probable market effects. It also examines a more recent econometric analysis done by an independent timber expert that accounted for market interaction and derived price forecasts from basic supply and demand projections. This chapter also covers imports and exports--a subject previously studied by the Stanford Research Institute and others--and the effect of current economic trends on regional employment and taxes. These subjects were dealt with, but only sparingly, in several of the studies.

THE OUTLOOK PROJECTIONS

The Outlook for timber in the United States projected prices at three levels (See fig. 11, left, on p. 28.) The low projection is a continuation of 1970 prices without change to 2000. The high projection is for real prices to rise at their long-run historical rate (1.5 to 1.7 percent a year), and the medium projection is halfway between those two. The high projection shows the real price to be 2.2 times higher than the 1970 price by the year 2000. The medium projection is for a 60-percent increase over the same period. This arbitrary increase occurs in 1970 and does not fluctuate for the next 30 years.

FIGURES 11 AND 12
ESTIMATED OUTLOOK FOR PRICE AND SUPPLY PROJECTIONS



SOURCE: OUTLOOK FOR TIMBER IN THE U.S.

We took Outlook's demand projections and, using procedures outlined in the "Report of the President's Advisory Panel on Timber and the Environment," (discussed in chapter 6) derived economic price projections based on three supply assumptions in the Outlook (see fig. 12, above right.) The base projection represented a continuation of present management practices. The intensified supply projection was based on increased investment that would raise supply levels late in the period, and the economic projection was based on an industry response to higher prices.

Surprisingly, although all the projections showed a substantial price rise, they were below Outlook's historical price trend projection, with only the economic projection continuing to rise much after 1990. Since these price rises were lower than experienced in the past, the national economy would

feel little or no effect from the Pacific Northwest supply situation. In general, Outlook projected a continuation of past national trends with decreases in the Pacific Northwest timber balanced by increases in other regions and imports.

Outlook's projections, made in the early 1970s, are by now somewhat dated and lacking in the more advanced projection techniques. The Forest Service is going to use a more sophisticated econometric model in its 1980 Outlook, which is already underway. A precursor of such an analysis is contained in a 1976 study by Darius Adams of Oregon State University. His report represented perhaps the most comprehensive and best analysis available of the future economic situation in timber.

THE ADAMS STUDY

The Adams study, published by Oregon State University in 1976, is entitled "Impacts of National Forest Timber Harvest Scheduling Policies on Softwood Stumpage, Lumber, and Plywood Markets: An Econometric Analysis." Compared to the Outlook pricing forecasts, those made by Darius Adams, using similar assumptions about harvests on public lands, indicated substantially higher price rises. Specifically, Adams found the increase in lumber prices to be 25 percent greater than did Outlook, and plywood prices increased 15 to 20 percent more. He forecasted that timber prices would rise much more rapidly--roughly a sixfold increase by 2000--and by so doing would cause greater harvests of privately-owned Northwest timber. Private harvests were 25 percent higher in the Adams study than they were in the Outlook forecasts--enough to require higher utilization rates, cause shorter rotations (periods between harvests), and eventually intensify the potential deficiency on private timberlands.

Adams forecasted that the stumpage prices (those paid for standing trees) in the Northwest would rise somewhat faster than in other regions, and, as a result, he predicted that the region would lose about 10 percent of its national market share. The Southeast would gain about 6 percent, and by the year 2000 imports (mostly Douglas-fir from British Columbia) would account for one-fourth of the domestic market supply.

If harvests in the Douglas-fir region were increased enough to hold timber price trends to their traditional rate of increase then, Adams found

--stumpage prices would increase but at a reduced rate;

- the Pacific Northwest loss of market share, would be slowed, but not stopped;
- import increases would be slowed but not stopped;
- supply, demand, and the price of plywood would be more affected than lumber.

Finally the Adams study explored the effects of even sharper harvest increases in public timberlands--up to 50 percent in timber cut between now and 1985--on the economy. Increases of this magnitude, he found, could halt the depletion of private inventories except that, because of tax effects, public timber would not be a complete substitute for timber cut on private lands. Adams concluded that public harvest increases were more likely to temper price rises and market share losses than they were to completely offset decreases in private timber inventories.

IMPORTS AND EXPORTS

The United States currently imports lumber and pulp products, primarily from Canada and, as already mentioned, the Outlook projected that the amount of these imports would grow in the future. One reason imports might grow is a difference in rail rates. It costs less to ship timber across Canada to the East Coast than it does to ship it from Washington or Oregon.

The United States also exports logs from the Pacific Northwest and Alaska to Japan. Again industry representatives point to transportation differentials as the reason. It costs less, they say, to ship logs from Washington to Japan than to send them by rail to Montana. At any rate, the issue of whether logs should be exported has received considerable attention in the Pacific Northwest. Opponents of log exports argue, among other things, that exports would reduce regional employment. They would prefer to see the logs milled into finished lumber in the region. Furthermore, any limiting of log exports could alleviate the potential inventory decline, which was the central issue of the reviewed reports. This question was studied by the Stanford Research Institute in 1974.

SRI's report, "Alternative Log Export Policies for the Long Term: Phase II Report," concluded (from a study of Forest Service base projections) that export restrictions would not prevent supply shortages or avoid serious regional employment problems. The report recommended increased public harvests and forest investment and export restrictions.

There are currently restrictions against log exports from trees cut on federally- and Oregon State-held lands. In practice, though, 70 percent of the log exports come from Washington State, and companies that rely on private or Washington State lands for timber are free to export.

There have been recent initiatives by Japanese trade delegations to buy finished lumber, and Japan has adopted U.S. lumber dimensions in order to facilitate this trade. High energy costs and the decline of the dollar against the Japanese yen should, it appears, further encourage this trend.

The large timber companies certainly would welcome the potentially vast Asian market for West Coast logs or lumber, and the Pacific Northwest, as a region, would undoubtedly benefit from increased lumber sales. The United States, Russia, and Canada are the only nations capable of any sizable softwood exports. A move to increased exports would, of course, help out the U. S. balance of trade, but it would also probably increase the total demand for wood and aggravate domestic supply scarcities.

REGIONAL ECONOMIC EFFECTS

Although there is a national concern with the availability and price of timber, the Pacific Northwest region's concern is with timber as a means to an end. As described in the Oregon State study:

"The end product to Oregonians consists of jobs, net income from places outside Oregon [the export base], a viable tax base to support community services, and the quality of life that goes along with economic well-being in idyllic surroundings."

All benefits in the quote above relate to timber in the Pacific Northwest. The industry directly provides one out of every three jobs--more than any other three industries combined--and timber provides one-third of all the value added by manufacturing in the region. The effects of the timber availability problem on regional employment were dealt with only sparingly in the studies and, we think, not too well.

One study, "Employment Implications of Projected Timber Output in the Douglas Fir Region 1970-2000," by Brian R. Wall of the Pacific Northwest Forest and Range Experiment Station, estimated that employment could decline by as much as 45

percent. It assumed, however, that timber prices would decrease from their long-term trends at the same time that supplies diminished and that none of the laid-off workers would find alternative employment--hardly a likely economic outcome.

The Oregon State study estimated employment could decline by between 3 to 25 percent by 2005 (depending on the harvest projection used) but acknowledged its failure to consider alternate employment in figuring the percentage. Rising timber prices, in fact, should lead to increased harvest activities and forest cultivation, thereby creating some, but not necessarily a sufficient number of, compensating jobs.

"The Timber Harvest Scheduling Issues Study" estimated Forest Service timber management employment would have to increase 82 percent over the next decade before the national forests could be managed at the high investment level defined in the study. Forest Service officials cautioned that total Forest Service employment is low compared to the timber industry. Also, the Forest Service typically assumed that management levels would remain constant on industry lands, while industry representatives generally predicted that they would increase.

Another important employment consideration is timing. Obviously gradual changes would be easier to adjust to than sudden downswings. Most of the projected declines were gradual, but neither the timing nor the employment trade-off mentioned above was really adequately dealt with in the studies.

Changes in harvest schedules would affect regional tax revenues and the distribution of tax payments; this includes State and local taxes on privately-owned timber and Federal taxes on timber sales. The Federal Government pays the counties a share of its timber revenues in lieu of property taxes. State income taxes are charged on the capital gains from timber sales. Various other taxes are also charged on timber harvests by local jurisdictions. It is difficult to estimate the net effect of all taxes, and none of the studies investigated the full range of essential tax issues.

The net tax effect depends on both the quantities harvested and the prices realized, which tend to be offsetting. The inelasticity of timber demand suggested in some of the studies could point toward higher total revenues and taxes because of decreased supplies.

CONCLUSIONS

More generally, though, if the supply shortages, continuing price trends, and loss of market share forecasted by Outlook were accurate, there could well be a long-term decline in both employment and revenue in the region. For public policymaking, we think these possible declines deserve further consideration, particularly since harvest policies are controlled by the Government.

CHAPTER 6

WHAT ARE THE ENVIRONMENTAL COSTS

OF INCREASED TIMBER SUPPLIES?

We would conclude from an examination of the studies discussed thus far that (1) current practices are likely (but not certain) to lead to a Pacific Northwest timber shortage in the years just ahead, and (2) that a shortage could be averted by a combination of increased forest investment and revised harvest schedules. The remaining questions, discussed in this chapter, concern (1) the degree and application of increased investment and (2) the environmental effects of the increased investment and revised harvest schedules.

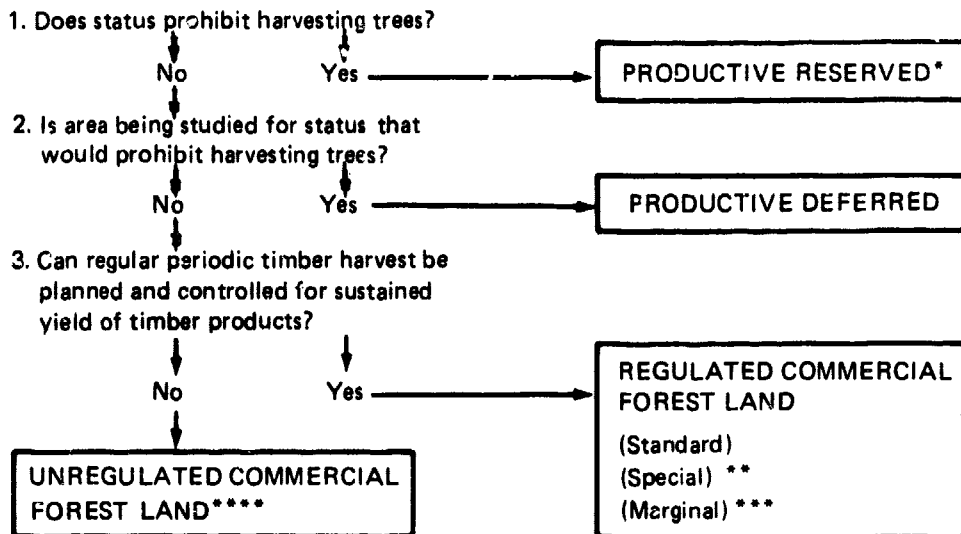
THE CONCEPT OF MULTIPLE USE

As mentioned in chapter 2, the objectives of "multiple use" are referred to in the National Forest Management Act of 1976 and even in the title of the Multiple Use-Sustained Yield Act of 1960. The term recognizes that the national forest lands serve the public in a number of ways--as a source of timber, minerals, and water; as a recreation area; as a wildlife haven; and as a source of ecological balance. The multiple-use objectives in the current law were to insure that certain uses (such as logging) did not preclude others (such as recreation, water-shed management, etc.).

In practice, multiple-use objectives are met in two ways: (1) by designating certain areas for particular uses and (2) by using harvest and cultivation practices in timber-growing areas that minimize interference with other uses. Prohibition of certain environmentally harmful logging and timber-processing practices enhances the nontimber uses of the forest, but regulation of such practices was apparently taken for granted in the studies.

The Forest Service currently classifies land in the national forests according to the scheme presented in figure 13 on p. 35. Timber production occurs mostly on regulated commercial land, and the figure shows that this class is essentially residual--though very large--and it remains after acreage has been set aside for other uses.

**FIGURE 13
GENERAL CLASSIFICATION KEY FOR PRODUCTIVE FOREST LAND**



* Wilderness areas are one example of land in this category.

** May include shelter belts along streams, visual barriers around clearcut areas, exceptionally steep lands, or habitats of endangered wildlife species.

*** Land which is deemed marginal for timbering because of poor productivity, poor location, or similar reasons.

**** May include experimental forests, recreation and administrative sites, special interest areas, or extremely remote sites.

SOURCE: Report of President's Advisory Panel on Timber and the Environment, 1973.

Timber supplies could be increased by reclassifying some potentially productive timber sites now reserved for other purposes as commercial-grade timberland. But not all land so classified can, in fact, support economical logging. Some could be withdrawn from the timberland base without greatly affecting production. Such reclassification was not proposed in the studies.

Most of the proposals for increased production concentrated on currently regulated commercial-grade forest land. Some of the studies, notably the Oregon State study, assumed that land now classified as marginal would become productive timberland in the future. All of the studies assumed that some of the currently productive land would be lost over time as it was withdrawn from timber production for other uses, and that intensified cultivation of the remainder would be required to maintain harvest levels from the smaller land base. This, in turn, could lead to complicated trade-offs between the timber and nontimber uses of that land.

MULTIPLE USE AND TIMBER INVESTMENT POLICY

Current Forest Service practices are land extensive because initial investments in reforestation of unstocked land and development of marginal lands to timber are applied to all possible sites before follow-up procedures like thinning or fertilization are applied to any. Such practices, as are normally introduced, are applied uniformly across all eligible sites. This approach could be justified because it minimizes the adverse effects of timber growing on other uses of the forest.

Furthermore, the Forest Service harvest schedule spreads old-growth harvests over more than 100 years, and in the "natural rotation" alternatives of the "Timber Harvest Scheduling Issues Study" (see p. 18), some trees were carried as long as 260 years. The study stated that the natural rotation schedule was proposed because

"* * * it will produce a forest which is more pleasing in appearance, which can be managed with less conflict between timber and other resources, and which will yield higher quality wood."

Thus, the longer rotation was considered primarily as a means to enhance nontimber forest uses, since it would surely lower yields and increase harvest costs. However, these Forest Service practices have been criticized by those who advocate concentrating more intense methods on a smaller land area as a more sensible way to provide for multiple uses of the forest.

The Oregon and Washington State studies (see pp. 21 and 22), on the other hand, proposed shorter rotations (60 to 70 years between cuttings on most lands), although the Oregon study did propose one 180-year rotation to protect special-class lands. Nevertheless these harvest schedules, along with the more intensive cultivation proposals, applied to both standard and marginal class lands, would appear to have the potential for negative effects on other uses of the forest lands.

THE DOMINANT-USE ALTERNATIVE

In one of the studies reviewed, "The Economics of National Forest Management," a 1976 Resources for the Future publication, its author Marion Clawson argued that at present the full benefits of the national forests, tangible or intangible, are not being realized. He laid the blame for this on less-than-effective economic management.

Clawson argued that it would be far more efficient to manage the forest by specializing sites with emphasis on the uses for which each was best suited. He pointed out, for example, that the lands most suitable for wilderness were seldom the same as those that were best for growing timber. This concept, referred to as the dominant-use idea, would specialize each forest site primarily by the use or uses for which each had a comparative advantage.

Proponents of dominant use maintain that it could increase all uses of the forest, even though certain uses might be diminished on particular sites. They reasoned, for example, that if the most productive timberlands were more intensively managed for that purpose, the same amount or more timber could be grown on fewer acres, thus freeing more land for nontimber uses.

THE ECONOMICS OF LAND USE

The economics of timber production in the Douglas-fir region would appear to favor the dominant-use argument as shown by Phase II of the Washington Forest Productivity Study referred to in chapter 4. The study estimated that the interest rates currently being used to calculate the return on forest investment were too low--by 2 to 5 percentage points--to reflect realistic market conditions. Since this study was based on postulated economic criteria rather than preselected investment levels and cutting schedules, the costs, especially interest costs, made a substantial difference in the area selected for increased investment. Generally, the higher interest rates required greater returns from harvests scheduled farther into the future and eliminated more land as incapable of generating these returns. In one of the study's projections, for example, the number of acres intensively cultivated for timber decreased by 25 percent over a 12-decade period. These sites would then presumably be available for recreation, wildlife, watershed, or some other use.

ENVIRONMENTAL IMPACTS

Most of the studies apparently assumed that the serious environmental damage to forest areas from past logging practices is over, as the industry is now regulated well enough to prevent recurrence. Nevertheless, especially as timber operations intensify, damage could occur to the soil, water, air, and wildlife.

In Douglas-fir forests, the only feasible harvest method is clearcutting, because the trees will not regenerate without adequate space and sunlight. Clearcutting is usually done in

relatively small patches of an optimum size to allow regrowth but also to protect the cleared area from weather and other natural damage. Clearcutting is very visible and has undesirable esthetic effects, particularly in the early years of regrowth when the area is barren of trees. Clearcutting certain areas can also present other hazards--soil erosion, for example. Typically, however, arguments against clearcutting in the Douglas-fir region, as noted in the President's Advisory Panel report, were really arguments against logging in any form.

Timber operations are currently subject to numerous laws and regulations, both Federal and local. Pesticides and prevention of water pollution, and soil erosion, for example, are federally-regulated, while controlled burning and air pollution come under numerous local regulations. The overall impact of these many environmental laws and regulations on timber operations is as yet unclear; hence, potential environmental damage from timber practices under current regulations remains largely undefined.

CONCLUSIONS

Only two studies we reviewed discussed the possible environmental damage from increased timber activities, and they reached quite different conclusions. The Forest Service "Timber Harvest Scheduling Issues Study" noted some positive effects but also found significant potential damage to soil, streams, and other ecological systems. The "Report of the President's Advisory Panel on Timber and the Environment," on the other hand, found that increased production need not have any real environmental damage and, in fact, could be beneficial.

We concluded that these apparently opposite conclusions were reached from differing assumptions on how timber operations would be conducted. The Forest Service study assumed the land-extensive approach described in chapter 6 while the Presidential panel assumed a more land-intensive, but less widely applied approach. This would allow excluding intensive operations on steep slopes or shallow, erosion-prone soils. The Presidential panel in effect concluded that intensified timber operations could increase environmental damage to the forests, but they did not necessarily have to.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Generally, we found that the differences, and even conflicts, in the conclusions reached by the studies were due more to differing assumptions than to faults in the data used or the ways the data was applied. Our reservations about the Forest Service methods--its assumptions about future price trends and private investment--were discussed in the appropriate sections of earlier chapters. Criticism of timber inventory figures is contained in a recent report by us. 1/

For the most part, however, the studies reviewed were well integrated and consistent with their assumptions and the purposes for which they were intended. Most used Forest Service data so the base was consistent as well.

More importantly for public policy, we believe that the studies arrived at a certain consensus on the general situation in the Pacific Northwest. Although they did not agree on what to do about it, the studies raised enough unanswered questions, in our view, to justify a reexamination of current timber growing and harvest policies. This is especially relevant because several of the studies that implied possible deficiencies in current policy were not readily available during the formulation of the National Forest Management Act of 1976.

The studies generally agreed that continuing current timber growing and harvesting practices would likely lead to a sizable drop of available timber from the Pacific Northwest region in the years just ahead. The economic effects, though of course less certain, appeared to be considerably higher timber prices, a loss of market share by the region (in part to imports), and possibly a decline in regional employment and income.

The studies also agreed that the regional timber shortage and its probable consequences could be averted by increased investment in growing timber, revised harvest schedules, or both. Intensified management was considered on both public and private lands, but revised harvest schedules were considered only for the National Forests.

The questions raised by the studies concerned (1) the optimum amount and application of forest investment, (2) what,

1/"Need To Concentrate Intensive Timber Management on High Productive Lands" May 11, 1978, (CED-78-105).

if any, changes should be made to harvest schedules, and (3) the extent of possible environmental damage or limitations on nontimber uses of the forest that could result from these changes.

In general, we thought the critics of current forest policy raised some serious questions concerning the consequences of its continuation. They generally concluded that timber, the most important national renewable resource, was not now being renewed at anything close to its potential growth rate.

The arguments in favor of current policy, while they may be equally or more valid, were less well developed in the studies. Thus the key argument in favor of present policy seems to be that it is less damaging to the environment than alternative policies. Environmental damage, however, has not been well defined as yet and was predicated on just one set of assumptions. The President's panel, using slightly different assumptions and just as thorough an analysis, questioned the notion that timber operations necessarily had to be damaging to the environment.

Our overall conclusion from the studies was that a comprehensive evaluation of alternative timber growing and harvest policies as they affect the economy (regional and national), the environment, and nontimber uses of the national forests remains as yet, to be made. Accordingly, we proposed to the Secretary of Agriculture in a draft of this report, that he undertake such a study and report the results to the Congress as a reconfirmation of present policy or make suggestions for policy changes, as his findings warranted.

AGENCY COMMENTS AND OUR RESPONSE

In reply, (See app. III) the Chief of the Forest Service informed us that because current harvesting policy had been the subject of much recent debate, a departmental level study of the subject had been completed in December 1977. As a result, he said that the Secretary of Agriculture would be considering three harvest policy options: 1/

1. Continue strict nondeclining (even) flow.

1/It should perhaps be noted that these are the only three possible legal options: retain the status quo, change it within the meaning of the law, or seek to change the law.

2. Increase harvests within the constraints of the National Forest Management Act of 1976.
3. Seek new legislation to further liberalize the current policy.

The Forest Service Chief suggested that any comprehensive analysis of the national or regional supply situation should be done through the periodic assessments required by the Forest and Rangeland Renewal Resources Planning Act of 1974. Any further analysis of site-specific timber harvest effects on the environment or nontimber resources would be left to an individual forest's regular planning system.

This approach would seem to imply that the harvest policy decision would be made separately from a comprehensive Forest Service analysis of regional and national supply effects and separately from a study of specific environmental and multiple-use effects. For purposes of public policymaking, we think a single report addressing the trade-offs on all these issues would be of maximum use to the Congress, and that is precisely what's lacking in many of the otherwise excellent studies we reviewed here.

Also, to be useful in public policymaking, the study should be timely, clear, and concise. Many of the Forest Service reports reviewed, while technically sound, were often long, complex, and lacking in meaningful conclusions. This same criticism had been made earlier in our review of Forest Service reports issued under the Forest and Rangeland Renewable Resources Planning Act of 1974, "How to Improve U.S. Forest Service Reports on Forest Resources" (Feb. 23, 1977, PAD-77-29). In another recent report, "The National Forests-- Better Planning Needed to Improve Resource Management (July 12, 1978 CED-78-133), we suggested improvements to the land management planning system, including the standardization of terms, format, and time frames with national standards for the plans of the various forest units. These recommendations are especially pertinent if such plans are to be used for decision-making on timber growing and harvest policy.

RECOMMENDATIONS

We recommend that the Secretary of Agriculture, drawing on the three harvest policy options referred to in the Forest Service Chief's letter of March 16, 1978, prepare a single comprehensive study for the Congress. It should evaluate the effects of alternative harvest and timber management policies on the economy, the environment, and the nontimber uses of the national forests. Such a report should recommend one of the three options outlined in the Forest Service Chief's March letter. In the event that the Secretary recommends continuation of a strict, nondeclining even-flow harvest policy, we think that a clear explanation should be given.

MATTERS FOR CONSIDERATION BY THE CONGRESS

As indicated above, the studies reviewed generally agreed that a projected decline in Pacific Northwest timber supply could be alleviated or averted through some combination of increased investment, and changes in the harvest schedules, and multiple-use practices of the national forests. This, in turn, would require increased Federal expenditures and it appears, changes to the National Forest Management Act of 1976--both matters for the Congress to decide.

We have indicated in this report the additional questions we think need to be answered to arrive at a sound legislative decision, and we have recommended that the Secretary of Agriculture report his findings to the Congress for that purpose.

In addition, we would point out that some of the seemingly more innovative ideas on these subjects were found in studies made by recognized timber experts outside the Forest Service, and also that those strongly opposed to more intensive forestry solely for environmental reasons were not well represented in any study. We believe these additional views would be useful in arriving at a balanced reconsideration of national forest legislation.

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9. "Timber Harvest Scheduling Issues Study," Forest Service, Department of Agriculture 1976. 1/
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19. "More Intensive Reforestation and Timber Stand Improvement Programs Could Help Meet Timber Demand," B-125053, General Accounting Office, 1974.
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1/Studies added during the review. Only a draft copy of the Phase II Report of the Washington Forest Productivity Study and of the Adams study could be obtained.

DEPARTMENT OF AGRICULTURE
PRINCIPAL OFFICIALS RESPONSIBLE FOR
ADMINISTERING ACTIVITIES
DISCUSSED IN THIS REPORT

| | <u>Tenure of office</u> | |
|---|-------------------------|-----------|
| | <u>From</u> | <u>To</u> |
| SECRETARY OF AGRICULTURE: | | |
| Robert Bergland | Jan. 1977 | Present |
| John A. Knebel (Acting) | Oct. 1976 | Jan. 1977 |
| Earl L. Butz | Dec. 1971 | Oct. 1976 |
| Clifford M. Hardin | Jan. 1969 | Nov. 1971 |
| ASSISTANT SECRETARY, CONSERVATION, RESEARCH, AND EDUCATION | | |
| (note a): | | |
| Malcom R. Cutler | Apr. 1977 | Present |
| Paul A. Vander Myde (Acting) | Jan. 1977 | Apr. 1977 |
| Robert W. Long | Mar. 1973 | Jan. 1977 |
| Thomas K. Cowden | May 1969 | Mar. 1973 |
| CHIEF, FOREST SERVICE: | | |
| John R. McGuire | Apr. 1972 | Present |
| Edward P. Cliff | Mar. 1962 | Apr. 1972 |

a/Title changed from Assistant Secretary, Rural Development and Conservation, in January 1973.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Post Office Box 2417
Washington, D. C. 20013

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(TM)
MAR 16 1978



Mr. Henry Eschwege
Director, Community and
Economic Development Division
U. S. General Accounting Office
Washington, DC 20548

Dear Mr. Eschwege:

In response to your December 27, 1977, letter to the Secretary, here are our comments on the draft of your proposed report to the Congress, Future Timber Harvesting in the Pacific Northwest: Prospects and Problems.

The National Forest timber harvest scheduling policy has been the subject of much debate in recent years. Accordingly, serious attention is being given to the need for major policy determination by the Secretary of Agriculture. A department-level report was prepared in December 1977, evaluating alternative policies to guide timber harvesting on the western National Forests. The Secretary is considering three alternative policy options:

1. Continue strict non-declining flow;
2. Provide for increasing harvest on individual National Forests above non-declining flow levels within the flexibility of the National Forest Management Act of 1976; and
3. Seek new legislation to further liberalize National Forest timber harvest policy.

The option chosen will accomplish the GAO draft report recommendation ". . . reconfirmation of present policy or as suggestions for any policy changes the Secretary finds appropriate."

Any comprehensive analysis of national or regional supply situations should be done through the periodic assessments required by the Forest and Rangelands Renewable Resources Planning Act. The 1979 Assessment will study the relationships among the uses and development of forest and range renewable resources, evaluate regional


stumpage market equilibrium solutions for all ownerships and investment levels, and assess environmental tradeoffs. Enclosed 1/ is a document that outlines the proposed contents of this new assessment. This assessment will address the points raised in the draft GAO report's recommendation.

We believe further study will be needed to evaluate the effects of timber management on the National Forests. Analysis of site specific timber harvesting impacts on the environment or on non-timber resources can best be examined through individual National Forest Land and Resource Management Planning. The approach would be consistent with the second option of the department-level report cited earlier.

Enclosed 1/ are specific comments and suggestions on the draft report that may be useful in finalizing the report to the Congress.

Thank you for the opportunity to review and comment on the draft report.

Sincerely,



JOHN R. MCGUIRE
Chief

Enclosure

1/GAO note: The enclosure referred to above is no longer current, as the Forest Service is preparing to issue in January 1979 a substantially revised final report on the subject. Likewise, the Forest Service's detailed comments on our draft report are no longer relevant, since the final report was revised for other reasons. Accordingly, both enclosures have been deleted.